“IL FAUT RÉCULER POUR MIEUX SAUTER.” (YOU HAVE TO STEP BACK TO JUMP FURTHER): AGRICULTURE, SUSTAINABILITY AND COMMUNITY RESILIENCY IN URBAN ENVIRONMENTS

by

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ABSTRACT

As the world continues its trajectory towards increasing urbanization, urban planners find the discipline confronting an ever-changing world; one in which rigid ideologies and static theories are giving way to the necessities of understanding the complexity of rapid urbanization, and how cities and their residents might best be sustained. Popular consensus on urban sustainability (in both research and public sectors) identifies the development of urban agricultural systems as a foundational component of urban resilience and sustainability, especially in developing countries and in urban communities facing social, economic and health disparities. This consensus has emerged in differing disciplines, from urban planning to public health and from human geography to sociology, but there remains a lack of discourse related to the potentially different outcomes of sanctioned vs. unsanctioned (i.e., formal vs. informal) uses of community green space in urban agricultural development.

The practice and academic study of urban planning increasingly recognizes the need for more research on urban agriculture and its relation to local food systems, spatial development, and local and regional economics, but there are many questions left unstudied and unanswered. Specifically, for urban areas to begin addressing both current urban agricultural production, and the potential for new urban agricultural systems,

consensus around “best-practice” urban agricultural methods, formal and informal methods of urban agricultural production, food safety and related issues must be addressed, in order to accurately assess the range of risks and benefits posed to communities by urban agriculture.

With such an analysis, yet more questions emerge: How do institutionalized systems of oppression in cities shape urban agriculture and those who practice it, and how might urban agriculture fit within the greater movement towards social and environmental justice for urban residents facing social, economic, and physical disparities? What is the role of urban agriculture in addressing the unique needs of localized food systems that vary widely city by city, and even neighborhood by neighborhood? What is the role of the urban planner in agricultural practice? Perhaps most importantly, there is the need to establish a comprehensive framework to answer one deceptively simple question: “who farms what, where, how, and why?”

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SECTION 1

INTRODUCTION

This thesis will describe my theoretical framework of the importance of urban agriculture from multiple perspectives, and critically assess relevant methods, findings, and shortcomings. By doing so, my intention is to provide recommendations related to urban agricultural production, possible applications and implications, and extensions of the scholarship in this field to other related disciplines.

I grew up, as many in "Generation X" did, in a world in rapid demographic and agricultural transformation. I was raised on the proverbial "family farm," which at 200 acres, would be considered an estate by most. For my family, it was considered both a step-down and a step-up simultaneously; downsized from the family's 185,000 acre ranch, the farm seemed quaint in comparison. My grandfather never stopped pining for the incredible expanses of the ranch, but for the rest of the family, it was a welcome trade. Reliable electricity, potable water and the other trappings of peri-urban America meant that life could become, simply, a whole lot *easier.*

For a number of years, until the suburban sprawl of Billings, Montana began rapping at the door in earnest, one thing that connected my family to our both our past

and present was food. My father broke with tradition (as did all his siblings) and became a banker, but we maintained strong cultural ties to our agrarian past through an enormous garden, seasonal canning and preserving, and a bread-making regimen that began with whole, locally (as in up the road) grown wheat milled in my mother's kitchen by what surely must be the last generation of free-standing household flour mills. As a food-systems researcher in the age of the "local first" movement, it almost seems impossibly idyllic, and even naïve. We were subsisting in a way that was rapidly changing in ways impossible to imagine at the time.

As I recall, I was in third-grade when I became self-conscious about my home-made lunches. In the liminal state produced by that most American of traditions, suburbanization, my grade-school was a hodge-podge of farm kids, trailer park residents, and the children of suburban commuters. In such proximity, modernity breeds contempt; the foods I loved at home became another marker of difference that I was desperate to escape from. I did not want homemade bread, homemade cookies, homemade anything. I longed for the easy, flashy lunches the "subdivision kids" (as they were known) brought: the pre-packaged chips, the cans of cola. In retrospect, I wanted to disconnect from the food system so interwoven into my own family history. I wanted nothing so much as the casual, laissez-fair relationship with food my more suburban classmates enjoyed, and all the associations of class and privilege that relationship embodied.

In a relatively short period of time, the relationship with food production that had been part of my family for generations began to fray. The values and culinary histories that had survived migrations from Norway, Italy and Scotland, the moves from "the ranch" to "the farm," were lost to convenience. The first to go was that most labor-

intensive of traditions: the postwar garden. Benign neglect gave way to neglect; eventually the garden was tilled under and replaced with sod. The next to go were the affiliated (and also labor-intensive) food preparation practices. No tomatoes to can meant no canning tomatoes, no more chickens or goats to milk, and fresh jam from my grandfather's bushes went from a large-scale production meant to feed the family for a year to a 10-jar vanity project for church bazaars. Homemade bread and other baked goods fared best, though that too rapidly winnowed from a weekly to monthly, then quarterly, then a completely random event.

It took me the better part of 20 years to realize what was lost. In my immediate family, we went in one generation from people who could produce enough of their own food for an entire *year* to people who could not butcher, or pickle, or can without the most specific of instructions. The equipment has long been lost to salvage sales, but could be replaced. The history cannot. Even more dramatic, however, is the almost-complete transition of the food system in which we were rooted. The changes of which my family took part were not taking place in our household alone, but were in fact taking place at an unprecedented level across our community, state, region, nation and world.

This research is the most recent development in a process that began with one simple act, assisting a Salt Lake City nonprofit organization in the design and development of a community garden. During that process, I gained a "fast and furious" real-world introduction to many of the themes explored herein, including the rights of autonomy and psychosocial independence associated with informal sector food production, the role of professional planners in working with underserved communities in urban agriculture efforts, the very real risks long-term urban environmental degradation

poses to both formal and informal urban agricultural efforts, and perhaps most importantly, the realization that for many people, the practice of urban agriculture is driven by necessities both physical (the need to acquire food more cheaply than that available in retail establishments) and cultural (the need to stay connected to one's culture through maintaining connection to one's "culinary ancestry"). In short, I experienced firsthand the complexities of an urban food system, and all such a system entails, including the interactions between individual and community, local and nonlocal, and formal and informal.

This realization led to a second, more pressing one: that an ever-increasing body of evidence related to global population growth, environmental degradation, urbanization and sustainability strongly indicates that urban agriculture may cease being a "luxury" for anyone, and in fact may be a foundational necessity for urban, environmental and even social sustainability worldwide, in a variety of city settings. In such a complex setting, urban agricultural systems might thus represent the type of resilient, adaptable model the world will increasingly rely on to solve complex problems

This thesis focuses upon an analysis of formal and informal urban agricultural systems in both developed and developing economies globally, and how social, environmental, economic and health inequities may be impacted both positively and negatively by this emerging trend. The aim of this paper is to leave the reader with a strong documentation of the need to devote more scholarship and municipal research to formal and informal urban agricultural practice and production, in order to begin transitioning to more sustainable urban environments, and by proxy, a more sustainable

world. Finally, this paper argues for the need to develop strong, evidence-based rationales for urban agriculture in all its myriad forms worldwide.

First, this thesis will present the findings of an extensive critical review of relevant literature. I will use this review to begin building consensus around core concepts related to urban agriculture and sustainability. Put simply, my goal is to provide a theoretical framework, and answer, in an urban context, the aforementioned fundamental question of who farms what, where, how and why. What similarities and differences exist between formal and informal urban agricultural production, and what valuable lessons might be used from each to inform the development of an urban agricultural "third path?" Who currently farms in cities, and what are the motivations? Where has urban agriculture taken hold, either formally or informally, and what commonalities exist, if any? How might urban agriculture develop in order to present new alternatives to large-scale food production, and new alternatives to broken food systems, rather than simply taking the problems associated with agrarian agricultural production and transporting them wholesale into the city?

Second, this paper will present my own theoretical framework on the importance of urban agriculture from multiple perspectives, and will describe and critically assess my methods, findings, and shortcomings. By doing so, my intention is to provide recommendations related to urban agricultural production, possible applications and implications, and extensions of my own (and others') scholarship in this field to other related disciplines.

The third section will review in detail the methods by which I conducted my research, and then describe and assess the findings and shortcomings related both to my

own research and the research of others. These findings and shortcomings will provide a final assessment of potential applications and extensions related to the intersections of urban agriculture, urban planning, and other disciplines, and my recommendations for both future research and practice.

SECTION 2

URBAN AGRICULTURE: AN ASSESSMENT OF EXISTING SCHOLARSHIP

The scholarly research related to urban agriculture and its intersections with environmental sustainability and urban resilience and community development is rapidly expanding, and leading to interdisciplinary scholarship amongst many disciplines both divergent and closely related. Commonly explored themes include reviews of the history of urban agriculture from the distant past to the present (Halweil and Nierenberg, 2007; Mougeot 2006; Steel, 2008); the technical aspects and material constraints of urban agriculture (Despommier, 2009; Mendes et al., 2008,); the presence and ongoing development of urban agriculture in developing urban environments (Lee-Smith and Prain, 2006; Halweil and Nierenberg, 2007; Irazábel and Punja, 2009); case-studies in urban-agriculture worldwide (Eizenberg 2008; Koont, 2009; Mark, 2007; Traveline et al., 2009; Ranasinghe, 2003); and the social, economic, environmental, and health dimensions of urban agricultural production (Grace and Diamond, 2009; Dubbeling et al., 2009; Halweil and Nierenberg, 2007; Hess and Winner, 2007; Hovorka, 2006; van Veenhuizen, 2006). As scholarship related to the aforementioned dimensions expands,

however, research related to urban agriculture taking place *outside* of developing countries, especially beyond the scale of the community garden or recreational food production, remains relatively understudied. Similarly, and pertaining equally to developed and developing urban environments, and formal and informal urban agricultural production, there has thus far been an insufficient analysis related to the need for a comprehensive framework that might facilitate an accurate assessment of urban agricultural methods, processes and procedures, including the very real risks and benefits associated with large and small-scale, formal and informal urban agricultural production, and how these risks to not apply to all communities or populations equally. This literature review will help bridge the current scholarship with the discipline's future research needs.

Urbanization and Agriculture: From Past to Present

The United Nations estimates that by 2030, some 60 percent of the world's population will live in cities, owing to natural increases in urban populations and rural-to-urban migration. Urbanization varies according to region (Latin America's population, according to the United Nations, is now 75 percent urbanized, whereas urban residents account for only 34 percent of sub-Saharan Africa), but the world's urban population is undergoing profound (and many say permanent) changes, and with this rapid demographic shift, new challenges and consequences for urban residents are emerging -- chief among them, urban poverty and food insecurity (Moreno et al., 2008, xi).

By the present year (2010), many of the largest cities in Asia, Latin America and Africa may well struggle to feed their populations. The sheer tonnage required to meet the demands of many of these cities is staggering. So too are the implications for

inadequate food distribution systems. The increases needed to feed the developing world's residents may well overwhelm an already taxed food distribution system, leaving massive numbers of residents undernourished or unfed. Thus, for all intents and purposes, much of the world's current and future agricultural production might well now be considered urban or peri-urban, meaning that it is both produced for consumption by urban residents and is occurring in or near urban areas (Moreno et al., 2008).

Urbanization for many of the world's cities has accompanied rapid increases in urban poverty and slum populations. Some 62 percent of residents of sub-Saharan urban areas, for example, live in slum conditions, and an estimated 43 percent of southeast Asian urban residents live in dwellings classified as "slums" according to a United Nations index (Moreno et al., 2008, p. xiii). Urbanization is not only associated with increasing urban poverty and socioeconomic instability in the developing world. The percentage of Americans living in poverty in the U.S. rose to 12.4 percent in 2002 and some 33 million residents of the U.S. identify as experiencing hunger or the risk of hunger on a daily basis (Siddiqu, 2010).

In many U.S. cities, urbanization is synonymous with a lack of access to healthy foods. A recent study in Detroit found that only a fraction of stores in socioeconomically depressed neighborhoods carried minimal healthy foods (products based on the USDA food pyramid) (Pothukuchi, 2003). In many poor neighborhoods, the unfortunate reality is that perishable foods are left on shelves longer, prices are higher, and choices are fewer. Urban agriculture has the potential to offset many of these challenges, and to provide better food security to urban residents.

The prevailing definition of urban agriculture (past and present, formal and informal) is simply "farming in and around cities" (Halweil and Nierenberg 2007, 49). Others expand this simplistic view somewhat by defining urban agriculture as "the growing of plants and the raising of animals for food and other uses within and around cities and towns, and related activities such as the production and delivery of inputs, and the processing and marketing of products" (van Veenhuizen 2006, 1). Both definitions are included here because the differences between them are telling, and reveal some of the emerging tensions in the scholarship of urban agriculture, namely, how to define a practice that on many levels could include any and all food production occurring in an urban environment, from the home herb-garden, to the meatpacking districts that still exist in some large U.S. cities. Urban agriculture is a vast discipline covering aquaculture, the raising of domesticated livestock, compost production, orchards, honey and beehive production and more.

Of the estimated 800 million people practicing urban agriculture worldwide, the percentage of urban residents engaged in urban agriculture varies from 10 percent in some large U.S. cities to over 80 percent of residents in certain Russian and Asian cities. The United Nations estimates that 80 percent of poultry consumed in Singapore is produced within the city, compared to 25 percent of vegetables. Bamako, Mali produces such a quantity of urban horticultural products that some produce is exported outside the city for consumption elsewhere (Community Food Security Coalition, 2003, 13).

Many associate widespread urban agricultural production with cities in developing countries, but in fact even in the United States some 30 percent of agricultural produce is produced within urban areas. Erroneous too are assumptions that the sheer

scale of production needed to meet the food needs of a large metropolitan area are beyond urban agricultural capabilities. The United Nations has declared that Shanghai, China is meeting the majority of its own food needs, and considers the city self-sufficient (Moreno et al., 2008).

As research expands our understanding of what constitutes urban agriculture and where it has taken root, questions emerge about who is farming the cities and why. Throughout Africa, urban agriculture is overwhelmingly practiced by women, as is also the case in South America (Moreno et al., 2008). Urban agriculture is a significant activity central to the lives and cultures of millions around the globe, but our understanding of the complexities of both the practice and practitioners, the myriad factors related to the adoption of successful, risk-free and beneficial formal and informal urban agriculture, is only beginning.

The width and breadth of urban agricultural phenomenon is intimidating, but it is important to note, because it successfully illustrates one overarching fact: historically, agriculture and urbanism have been, and will continue to be, closely linked. Pre-industrialized food production, storage, transportation and distribution methods simply placed constraints upon where urban foods came from in the past (Halweil and Nierenberg, 2007; Mendes et al., 2008; Moueget, 1994; Steel, 2008), while rapid urbanization and ever-increasing fuel and transportation costs place new constraints upon where urban foods come from in the present.

From the mid-19th century on, however, rapid industrialization coupled with significant changes in demographic population patterns has colluded to drastically alter the food and agricultural environments associated with cities. Urban and peri-urban

agricultural lands once directly associated with city food production have been lost to urban sprawl, and the agricultural activities still taking place in cities (livestock processing, for example) have changed from representing a city's food solutions to representing a city's food-associated problems.

Industrial waste, agricultural pollutants and other urban wastewater threats have rendered many urban environments unsafe for agricultural production (Cole et al., 2009; Halweil and Nierenberg, 2007; Pollan, 2008; Pothukuchi and Kaufman 1999, 2000), and restrictive zoning and land-use policies have in many cases made urban agriculture illegal (Halweil and Nierenberg, 2007). Thus, urban agriculture, once a part of daily life in all cities, is now marginalized, characterized as an activity "associated with underdevelopment, land squatting, ineffective urban management, and related socioeconomic problems" (Mendes et al., 2008, 436).

Though urban agriculture may now, in many cities, occur in both physically and metaphorically marginalized areas one fact remains: urban agriculture continues to represent a significant contribution to the world's food supply. An estimated 200 million urban farmers currently produce some 20 percent of the world's food supply (Armar-Klemesu, 2000, 99-218). The United Nations estimates that more than 800 million people are involved with urban agriculture worldwide, of which only 200 million are producing food primarily for market, indicating that the overwhelming majority of the world's urban farmers are raising food for their own necessity (City Farmer, 2010).

Of note is the fact that this recent evolution is largely associated with the so-called "developed world," and formal methods of agricultural production. In Third and Second-World urban environments, formal and informal urban agriculture always remained an

integral part of urban life, largely associated with the same factors that once predicated urban agriculture in the developed world: a lack of access to efficient industrial food production, transportation, and distribution methods (Cole et al., 2009; Koont, 2009; Mark, 2007). Thus, urban agriculture has emerged from a once historic commonality of urban existence across cultures, economies, and geographic parameters to a representation of greater disparities across cultures -- between so-called "developed" and "developing" regions, between urban and rural areas, and even according to racial, gender, and socioeconomic determinants (Mendes et al., 2008).

Urban food production, large and small scale, formal and informal, is demonstrating a strong resurgence. "The same needs that had given rise to urban farming in ancient times had reappeared" (Halweil and Nierenberg, 2007, p. 50). Transportation-associated costs, rapid urbanization, and growing environmental awareness have combined in the developed world to encourage wide-scale interest in urban farming (Boyd, 2009; Irazábel and Punja, 2009; Mendes et al., 2008), and advances in urban agricultural technology, urban waste-water treatment, and regulation of environmental pollutants (lead-based gasoline, for example) have laid a strong foundation for safer urban agricultural production at scales not seen since before the Industrial Revolution (Despommier, 2009; Grace, 2009).

Urban agriculture is also emerging as a key-response to the increasingly high social-costs of the industrialized modern food system. Industrialized agricultural production has increased crop yields around the world, and paved the way for year-round access to nearly all fruits, vegetables and other agricultural commodities, yet this same production system is directly tied to malnutrition (both obesity and hunger-related

illnesses), city and regional-level food insecurity, poverty and other social disparities (Halweil, 2002).

From addressing food security, facilitating nutrition for urban residents, from social justice advocacy to recreation, and from public health to economic theory urban agriculture is increasingly viewed as a historical legacy well-deserving of a place in the modern world (Dubbeling et al., 2009; Halweil and Nierenberg, 2007; Irazábel and Punja, 2009; Mendes et al., 2009). Like other policy recommendations and frameworks, however, urban agriculture requires a purposeful and systematic course of action if it is to both meet the diverse and growing demands of urbanization and the need for greater environmental sustainability. To meet these ends, urban planners, policy makers and practitioners of both formal and informal urban agriculture will need to work together to develop practices that are based on shared principles. This paper argues that such principles should include the fundamental human right to nutritious food, the economic and social benefits of urban agriculture, equity within formal and informal urban agriculture across social and economic domains, and sound principles of resource allocation and use in urban agriculture that are congruent with environmental sustainability.

Technical Aspects, Material Constraints and Transformative Technological Potential in Urban Agriculture

As urban agriculture emerges from its associations with archaic urban environments to associations with cutting-edge urban development, an increasing body of work devoted to technological innovation and other technical and material dimensions related to urban agriculture has emerged. The second research theme germane to this

literature review concentrates on establishing dimensions and parameters related to varying forms and degrees of urban agricultural production.

Urban agriculture is, in reality, "urban agricultures." All urban agricultural methods share a common goal (food production), but the typologies upon which the methods develop vary widely according to the environmental, geographic, cultural, and technological capacities of the given urban environment. In Accra, Ghana, urban agriculture may involve utilizing household waste-water to grow fruits and vegetables in a small garden plot. In Detroit, urban agriculture has taken the shape of large-scale urban farms. Organizations such as Growing Power grow a wide variety of food for urban residents, meeting the needs of urban residents on a scale unrivaled in most developed urban locations (Bybee, 2009). Informal urban agricultural activities share much in common with historical agricultural methods, urban planners, horticulturists and engineers are developing plans for future urban agricultural systems that have little to nothing in common with agricultural methods used in either urban or rural settings in the past.

Despommier (2009) calls for the emergence of new forms of urban agriculture that would harness technological advances in material science with the need for sustainable urban food systems to meet the needs of the world's potential 9 billion residents by 2050. Utilizing indoor growing conditions in new and retro-fitted high-rise buildings and roof-top greenhouses in existing skyscrapers, Despommier calls for a comprehensive closed-system that would utilize urban wastewater, photovoltaic panels and wasted urban space to meet the food needs of urban residents year round. Despommier calls for additional components of vertical gardening that would recycle

wastes into energy to apply to a city's electronic grid. Other cities worldwide are developing rooftop gardens in existing buildings, proving that urban agriculture and the existing built environment can harness the technological benefits available at minimal cost for maximal benefit (Dubbeling et al., 2009; Halweil and Nierenberg, 2007). Many individuals (including urban planners and policy makers) might assume that urban agricultural production is less productive than rural agriculture (because of scale). In fact the opposite has been demonstrated. Intensive urban agricultural production can produce agricultural yields much larger per acre than rural farms (Heimlich, Barnard, 1993).

Cuba's contributions to urban agricultural production warrant specific inclusion, and are well documented in literature, primarily based on two components: the large-scale upon which urban agricultural activities are conducted, and the reliance upon technological innovation to predispose of the need for nonorganic farming methods.

Motivated by the rapid collapse of the Soviet Union, and with few trade options owing to the U.S. embargo, Cuban officials made a concerted effort to begin meeting the food needs of urban residents without pesticides and other agrochemicals, expensive farm machinery, or vast reserves of petroleum. Forced to make due literally almost overnight without the standard machinations of industrial farming, Cuban officials forged a new path. Dubbed "organoponico" for its reliance upon organic methods and hydroponic technology (Koont, 2009), Cuba's urban farms now provide Havana's residents with almost all of their produce, and have become an important contributor to the city's economy (Halweil and Nierenberg, 2007). Large-scale organoponico agriculture is only one component of Cuba's emphasis on urban agricultural production. The decisive shift postcollapse of the USSR also prioritizes and supports local food co-ops, backyard patio

gardens, and other informal agricultural sectors. Currently almost all Cuban residents supplement their diets with home-grown fruits and vegetables (Mark, 2007).

From Growing Power's aquaculture farms to Despommier's quasi-utopian vision of where urban agricultural production *could* go, to Cuba's extensive contributions towards emerging practices of large-scale urban agricultural production synonymous with environmental stewardship and sustainability, an emerging trend is taking hold. Common among all of these developments and advances, as disparate as they may appear, is the correlation between urban agriculture as an emerging necessity for both urban and global environmental sustainability. These divergent theories and methods are united by one common conceit: urban environments are extremely unlikely to continue meeting the nutritional needs of their urban residents without a return to urban agricultural production.

Urban Planning and the Social, Economic, Environmental and Health Dimensions of Urban Agriculture

Increasingly, scholarship devoted to urban agriculture and its associated literature focuses upon the many intersections of social, economic, environmental, and health dimensions of urban agricultural production, both positive and negative. Why has urban planning, which so frequently considers these and other dimensions of urban existence, largely neglected to consider the vast importance and wide-ranging implications of urban agriculture on the life of the city?

The dimensions of health and well-being discussed above are gaining attention in both urban planning and urban agricultural scholarship, and there has emerged a separate, yet related, issue: the increase in abandoned or vacant parcels in urban environments.

Bailkey and Nasr found that Chicago has some 70,000 vacant parcels of urban land, and that abandoned lots in inner-city areas remained vacant for an average 20 to 30 years. The U.S. General Accounting Office has identified 130,000 to 425,000 vacant industrial sites that while contaminated could be safely converted to urban agricultural production (Bailkey and Nasr 2000, 7).

City and regional urban economics too stand to benefit from the development of planning practices and policy development that supports urban agriculture. The National Research Council of Canada found that the development of "green rooftops" (that could be planted with productive gardens) in just 6 percent of Toronto's buildings would not only correlate to a reduction of greenhouse gas emissions by 2.18 tons a year, but would create some $5.5 million in locally produced fruits and vegetables annually. The Maine Organic Farmers and Gardeners Association has estimated that $104 million would be injected into local economies if every Maine family spent just $10 dollars a week on locally produced food (Carter et al., 2003, 8).

The development of deurbanized food systems in industrial societies gave rise to perceived beliefs that food production was a "rural" issue, and thus had no place in planning the modern urban environment (Pothukuchi and Kaufman, 2000). Relegated to disciplines housed within the natural sciences (horticulture, ecology, botany), urban agriculture as a formal sector activity, when it did occur, was viewed as "outside" the realm of professional planning. Pothukachi and Kaufman have identified six overarching rationales for why planners have not perceived urban agricultural production to fall within the sphere of urban planning: 1) Planners should focus upon the built environment and land-use regulation, 2) agricultural production is a rural issue, 3) agricultural

production is a private-sector issue, 4) there is insufficient financial support for urban agriculture as an formal urban planning activity, 5) planners were themselves unaware of the need to develop new urban agricultural methods, and believed in the status-quo food system, and 6) planners lacked the scientific and technical knowledge necessary to integrate agricultural production within the discipline (Ibid., 1999, 113-124). Additionally, urban planning is frequently characterized by a focus upon "big picture," comprehensive land use planning and policy development, and as such, has not historically lent itself well to responsiveness to social concerns that arise in (relatively) short periods of time (Mubvami and Mushamba, 2006).

The perception that agriculture is a "rural concern" has other far-reaching consequences for urban planning outside of those identified above. Significantly, many planners (and by proxy cities) may be disinclined to address urban agriculture out of the perception that to formally institute policies and practices supportive of urban agriculture would be to enter into a complex and expensive overhaul not just of the built environment, but of entire local and regional economic systems. In reality, several "real world" examples keenly illustrate the ability of large urban communities and populations to meet the agricultural needs of their residents with a minimum of economic input or administrative effort.

Following the collapse of the Soviet Union in the 1990s, Russia found itself in a food crisis. Food production in traditional industrial-scale rural farms fell alarmingly and prices in the newly established free market skyrocketed. Policies enacted since allow the use of idle or unused urban lands to grow or distribute locally grown, urban agricultural products. These land uses now significantly contribute to the food grown within Russia,

and an overwhelming majority of the vegetables grown in the country (Moreno et al., 2008). Anyone who has visited Russia in recent years can attest to the rapid institutionalization of such practices-- outside of subway stops, on city sidewalks, and on apartment stoops, small-scale urban agricultural producers selling locally grown produce, providing for many a modest income that might otherwise not exist.

Around the world, urban centers are demonstrating their abilities to offset many of the agricultural needs of their residents in a variety of ways and to varying degrees. Havana, Cuba produces most of the produce consumed by its residents (Friedrich, 1999), and Singapore's urban agricultural producers have achieved economies of scale perhaps unrivaled globally. Even cities that have not yet institutionalized large scale urban agricultural production are demonstrating rapid transitions towards locally-produced food systems. Fourteen percent of Londoners and 44 percent of Vancouver residents grow some of their own food. The state of Massachusetts, with 12 of 14 counties designated urban, produces 15 percent of its own food, though conservative estimates predict that the state could produce up to 35 percent of its food needs in urban areas even without resorting to the use or repurposing of vacant lots or rooftop agricultural production (Carter et al., 2003, 10).

Urban planners, economists and others have been afforded the ability to ignore the intersections of urban planning and urban agriculture in the past, but such worldviews are increasingly out of sync with a rapidly changing urban world. The challenges of meeting the daily realities of an urbanizing world are becoming ever more apparent, and at the forefront of these challenges lies the unique demand of feeding the world's urban residents. In the United States, food destined for urban consumers typically travels great

distance from its point of origin to its point of consumption when compared to historical distribution patterns. Many of these products spend as long as two weeks in transit, which contributes to very high spoilage rates. To offset this, many agricultural products are now selected based upon their ability to withstand such laborious journeys, thus contributing to a decrease in overall food diversity and choice for urban residents, hallmarks of large-scale food insecurity in urban food systems (Halweil and Neirenberg, 2003, 60).

As if the above challenges to integrating urban agriculture into urban planning praxis were not daunting enough, there is an increasing recognition of how social, environmental, economic and health disparities can be shaped, reinforced, or alternately negated by urban agricultural production both formal and informal. Thus, for planners already uncomfortable with the need to integrate components of new scientific disciplines into their academic and professional roles, there has emerged an additional level of complexity: the need to recognize the overlaps among nutrition, local food production, urban environments, equity and the right to self-determination.

Disadvantaged Populations

Urban agriculture is strongly linked to the potential for gender equity in developing countries. Urban agricultural production can provide employment and alleviate poverty and facilitate integration in groups facing social, economic and health disparities, including women, persons affected by chronic disease, persons with physical and or mental disabilities, elderly persons, and unemployed young people (van Veenhuizen, 2006; Gonzalez-Novo and Murphy 2000).

Hovorka (2006), Lee-Smith and Prain (2006) and Nabulo et al. (2004) have documented not only the transformative potential for gender equity associated with urban

agriculture, but also the unique risks associated with women and urban agricultural practices. These authors have demonstrated that in many urban environments, men simply have more economic options than women, and that urban agriculture, while potentially representing access to much-needed nutrition, or economic opportunity, or both, must be carefully developed in order to prevent unanticipated negative consequences from co-occurring. Nabulo et al. (2004), for example, found that both men and women farming on heavily-polluted land in Kampala, Uganda were aware of the risks associated with such activities, but needed the food, the income, or both. Both were aware of the risks, yet men were two-times less likely to state that being forced to stop farming the degraded parcels would create an economic crisis for themselves or their families. Yhe men had both more economic and physical / geographical flexibility, whereas the women were likely constrained by both to very risky agricultural practices placing themselves, their families, and others at risk.

Autonomy

Similar to the gender disparity dimensions of urban agriculture, there exist important potential intersections among urban agriculture, socioeconomic inequality and environmental risk that should be considered from an urban planning perspective. "People have a right to participate in questions affecting their livelihoods" (Grace & Diamond 2009, p. 38) and for many urban dwellers in both developing and developed countries, urban agriculture will play some part of that livelihood, whether conducted as a formal or an informal activity.

The increasing privatization of urban green space and, by proxy, criminalization of informal urban agriculture practices has both real-world and psycho-social

implications for the urban residents farming such lands. These restrictive planning practices disproportionately affect the urban poor and racially-marginalized communities (Irazábel and Punja, 2009). By "planning" only to restrict who may grow what and where, urban planners may create the unintended consequence of urban residents growing food in environmentally degraded areas or environmentally sensitive ones. Such an act in turn may create an *additional* disparity for the urban resident in question, who by growing food next to a roadway, or upon the remains of a municipal dump, risk consuming environmental toxins that have accumulated in his or her foodstuffs. Researchers have demonstrated that in Kampala, Uganda, the city's poorest and most at-risk residents are forced to grow foodstuffs in environmentally degraded areas (Nabulo et al., 2009).

Poor urban residents in developing countries face elevated rates of zoonotic pathogens related to urban agriculture, through the use of human and animal excreta for fertilizer, and compounded by the lack of potable water for food preparation and personal hygiene (Grace and Diamond, 2009; Halweil and Nierenberg, 2007). Unfortunately, for many urban areas' neediest residents, urban agriculture is both a dietary and economic necessity, and these needs can easily outweigh the risks associated with farming in environmentally degraded urban environments.

Health

Urban agriculture, by providing increased access to fresh, healthy foods, has a strong correlation to improved health and a decrease in health disparities facing urban residents; in fact, the relationship between urban agriculture, food security and healthy nutrition in urban populations may be its single most important contribution.

Urban agriculture also offers individuals and communities, especially those facing socioeconomic, health, or environmental disparities, tangible benefits. Researchers have assessed urban agriculture from perspectives beyond the traditional benefit analysis of environmental, income and food security. The authors include in their benefit analysis of urban agriculture the "five capitals" developed by the United Kingdom's Department for International Development: human (dietary, skill acquisition), natural (soil remediation, environmental conservation), physical (infrastructure improvements in the urban environment), financial / economic (family income, asset development), and social (status, community interaction and civic engagement, psycho-social benefits of increased self-determinism) (Grace and Diamond 2009, 38). Others have documented the specific health benefits associated with urban agriculture, which include both physical and mental benefit (Bellow, 2006).

Environmental Benefits

Of all the dimensions related to the intersections of urban agriculture, urban planning, and individual and community wellness, perhaps the most important are those related to environmental benefits for the urban farmer, the urban resident, and the environment itself. The world's urban population is rapidly increasing, by 2030 it is estimated that some 60 percent of the world's population will live in urban environments, growing to an estimated 6.4 billion urban residents by 2050 (Dubbeling et al., 2009, 3-11). At the same time, cities are confronting with increasing regularity vulnerabilities related to food safety and distribution caused by environmental factors. The possibility that the era of cheap fuels upon which rural agriculture depends is over has left many

urban planners, bureaucrats and residents alike contemplating a world without access to foodstuffs produced half a world away.

Climate change, already wreaking havoc on municipal water supplies and putting cities at risk of disaster-related food shortages, has also brought to the forefront the necessity for drastic changes in both agricultural production and distribution, and the need for more environmentally friendly farming practices (Dubbeling et al., 2009; Halweil and Nierenberg, 2007; Pollan, 2006). Urban agriculture can potentially positively impact the global environment, by reducing urban heat-island effects, capturing storm-water runoff, reducing city-dependence upon carbon-intensive fossil fuels (used in food transportation), contributing to improved air-quality and providing environmental buffers against natural disasters. Finally, urban agriculture may be a key element in reducing global greenhouse gas emissions, as both the current elevated levels of carbon dioxide and nitrous oxide in the environment are strongly associated with the land-clearing practices of industrial-scale agriculture, the outputs of animals raised in the industrialized agricultural complex, and the fossil-fuel based transportation methods required to transport industrial agriculture long distances (Halweil and Neirenberg, 2007).

Urban Agriculture, Food Safety and Sustainability

As urban agriculture reemerges as a key component of meeting the food and nutrition needs of urban residents in both developed and developing countries, so too has the call for urban policy decisions that will facilitate safe and sustainable urban agricultural practices.

Traditionally, agricultural policy, especially in First World countries, has focused upon rural agricultural practices and urban agriculture has received scant attention in

public policy and planning sectors. The establishment of agricultural policy specific to urban agriculture represents a definitive step in the transition of urban agriculture from a frequently informal sector practice into an essential institutional practice in urban environments (Tacoli, 2001; van Veenhuizen, 2006).

Comprehensive urban agricultural policy development can positively impact both urban planning and the development of "best-practice" based urban agricultural practices by contributing to comprehensive urban policy and land use decisions through the formal acceptance of urban agricultural practices, by better utilizing vacant urban space, by promoting practices that will enhance food safety and security for urban residents, by fostering productivity and economic activity within urban settings (especially in those facing lingering consequences of long-term shifts in economic viability), and by comprehensively addressing the health and environmental risks associated with urban agricultural production (van Veenhuizen, 2006).

SECTION 3

DESCRIPTION AND CRITICAL ASSESSMENT OF MY THEORETICAL FRAMEWORK

My theoretical framework is a synthesis of two foundational components. First, I believe that psycho-social implications related to the intersections of urban agriculture, informal use of urban green space, and autonomy and self-determinism are very real, and have very real impacts on individuals and communities. Second, I believe that these determinants are under-addressed considering the breadth and depth of their impact on urban systems.

The Right to the City

> *The space in which we live, which draws us out of ourselves, in which the erosion of our lives, our time and our history occurs, the space that claws and gnaws at us, is also, in itself, a heterogeneous space. In other words, we do not live in a kind of void, inside of which we could place individuals and things. We do not live inside a void that could be colored with diverse shades of light, we live inside a set of relations that delineates sites which are irreducible to one another and absolutely not superimposable on one another* (Foucault, 1967, 46).

In his canonical work "The Production of Space," Henri Lefebvre begins by tracing the evolution of geographic space from a purely geometric perspective to our

current understanding that physical space also shares "status" as a "'mental thing' or 'mental place,'" a space that is socially produced (Lefebvre, 2004, 3). I share with Lefebvre the view that space thus can serve as a "tool of thought and action" (Ibid., 26) and that one cannot separate urban land use and production, power, domination and control. In short, urban agriculture, on scales ranging from the informal sector to the formal, from the backyard garden to large-scale urban agribusiness, always represents more than food, commodity, and production. It represents also what Martin Jay refers to as all "other spatial configurations with all of their ideological and cultural meaning… on the spectrum whose ends we designate with those impossibly vexed terms 'culture' and 'nature'" (Jay, 2007, 45).

Related to urban agriculture and associated concepts such as environmental racism and socioeconomic determinism, the theoretical framework of physical space as Lefebvre's potential "tool of thought and action" transitions from the metaphorical to the physical, from the theoretical to the concrete. A family from an oppressed minority group eats toxic food because it has been raised on the periphery of a garbage dump; a successful informal agricultural development in downtown Los Angeles is destroyed because urban farmers did not have the permission of city officials. These examples are intended to illustrate one side of what is essentially a binary proposition. If there exists the potential for the intersections of physical space, culture, meaning and socioeconomic determinism to create both physical and nonphysical negative outcomes in individuals and communities, how might these same factors be used to create positive physical and environmental outcomes for individuals and communities?

Theoretically, utilizing urban space and urban agriculture as positive versions of Lefebvre's "tool[s] of thought and action" is as possible as the negative consequences of the same tools. An important theoretical foundation of Lefebvre is that the hidden structural underpinnings of psychosocial determinism, power, domination and control in urban agriculture specifically and uses of urban space generally are neither accidental nor coincidental, but intentionally scripted. The family eats food raised in a municipal garbage dump not because that is the only land left, but because that is the only land allocated them, formally or informally. The urban farm in Los Angeles is destroyed because it represents a concrete threat to the status quo, and power must be reinforced in such circumstances, or it ceases to be relevant; it ceases to be power. Purcell refers to this imbalance as nothing less than a refutation of basic human rights. "Not just the right to speak in a public space, but to decide the geography of public space; not just the right to be housed, but the right to decide the geography of public housing" (Purcell, 2005, 201).

A major self-criticism of my theoretical framework lies in the fundamental limits to human knowledge, especially in realms difficult, if not impossible, to quantify in concrete terms. What is the value to the sense of autonomy and self-determinism that may be associated with informal urban agricultural production? What is the value of the "right" to decisions made around the "geography of public space"? What our cultural evolution *does* allow us to quantitatively value is really only the material outputs, or perhaps the earned income equivalent. We may, by a stretch, be able to correlate this "value" to other determinants, to economic, physical, health, or even the social capital that accrues with one's ability to raise their own food. What we do not know is which came first, the self-determinism or the accrued capital. Conversely, we do not know that

autonomy and self-determinism a) are causal or associative in their relationship with urban agricultural production, and b) we do not know that other determinants, such as those mentioned above, are causal or associative in *their* relationship with the development of autonomy and self-determination. Of course, there also always exists the possibility that self-determination and autonomy are in fact associated with an unknown independent variable, or a synergistic combination of many social indicators, of which the rights to space and food production are one of many.

Research Methods

Initially, I utilized texts read in past classes, and texts utilized in other academic programs and research efforts to begin the trajectory of my study. I also utilized the University of Utah research databases to begin identifying journal articles that could inform my research. Almost immediately, however, I realized that this method was returning literature that while interesting, and potentially useful, also represented the full gamut of any and all research done related to urban agriculture. As this paper is not meant to be a comprehensive overview of any and all aspects of urban agriculture (such a work would fill volumes, not pages), I realized that I would need to employ a more specific method in order to narrow down my research, one that would also potentially offset the fact that urban agriculture is very much an emerging area of research, by utilizing the expertise of those who had done work in my specific area of interest to point me towards other scholars.

To borrow a phrase from public health and sociological research, in short the closest description to my research method was "snowball sampling." Because my topic is both an emerging one and one informed by many different disciplines, I needed to find a

"starting place." Thus, I did an initial review of sources I was already familiar with, in the hopes that some or all of them might offer recommendations for more specific research. In turn, I read and reviewed these sources in hopes that they too would point me in a more specific direction.

This research method has some very real strength. By building upon layers and levels of research to inform the narrative development of my own work, I was able to continuously refine and recalibrate my theme and the overall trajectory of my work. However, this method also has one very distinct and problematic drawback, one well deserving of a critical assessment-- the method can lead to an inherent bias in one's research. Theoretically, if those papers that I included in my research and literature reviews utilized the same method, the research related to urban agriculture could be described as both myopic and heavily biased in favor of urban agriculture. For example, if all the papers that I utilized for my research presented only the framework that urban agriculture should be the primary efforts to address global climate change and the empowerment of disenfranchised urban residents, and ignored any research that contradicted this, I would not trust my own conclusions. To offset this risk, I made sure that I was not only using "snowball sampling," and that was also making objective efforts to look at both supportive research and research that raised questions and concerns about the benefits and risks of urban agriculture, both environmental and social.

Assessment of Findings and Shortcomings

Urban agriculture is currently a part of everyday life for many individuals living in cities worldwide, and it will grow as a part of everyday life for more and more individuals living in cities as urban areas develop and confront a world facing drastic

changes in environment and the associated factors directly related to long-term urban sustainability. Reflecting the fact that urban agriculture exists in a liminal state as both a practice and potential practice, my findings fall into two distinct categories: urban agriculture as practice, and urban agriculture as research and / or theory.

Urban agriculture as practice reflects that for many of the world's urban residents, urban agriculture "never went away." Urban agriculture is not recreational in nature, is not something done to lower an "ecological footprint," it is a daily reality that is done out of the need to meet one of human kind's most basic needs: the need for food. My findings related to this research category echo both my theoretical framework and very "real world" concerns. On the one hand, I feel I have demonstrated the importance of looking at urban agriculture through the lens of many different indicators and social dimensions; for example, the need to assess implications of gender and socioeconomic inequality on urban agriculture. On the other, I consider my findings largely concrete in nature. Urban agriculture exists, and should not be ignored, and urban planners and those working in closely related disciplines should be obligated to ensuring that it can be done safely, that it is not a practice that could cause harm intentionally or unintentionally, and that its ongoing development should be informed by working closely with those practicing urban agricultural production in their own communities as part of their own daily reality.

The second category is far different, and describes urban agriculture as a largely theoretical practice. I found that a great deal of scholarship related to urban agriculture is based on the theoretical development of how urban agriculture could develop in order to meet the food needs of urban areas on economies of scale. These findings in fact raise more questions than they answer. Would Despommier's "skyscraper farms" of vertical

gardens truly utilize fewer resources? Would the material needs of their construction offset the potential ecological benefit of fewer transportation associated emissions? Ultimately, many of the theoretical frameworks left me questioning both their "real world" applicability and the potentially negative outcomes that may be associated with their development. A rooftop garden is one thing, but can most municipalities afford to devote prime urban real estate to the development of large-scale urban farms?

An additional concern is that those companies most likely able to meet the extensive costs of such developments are those already associated with negative agricultural practices that have both harmed the environment and also contributed to the decline in health associated with many urban environments and the residents who live there. In short, will the urban agriculture of the theoretical future be associated with a departure from past practices, or will it be something closer to the replication of industrialized agricultural production within a city context?

Both categories can be synthesized into the following conclusions. Urban agriculture is already occurring in both the developed and the so-called developing world, urban agriculture is practiced for different reasons by different individuals and communities, urban agriculture stands to benefit many individuals and communities, but a more accurate assessment of risks associated with urban agriculture is required to make recommendations related to urban agriculture praxis that do not involve negative unintended consequences, and finally, urban agriculture will be a necessity for urban environments to continue meeting the food needs of their residents, and quantifiable assessments of such complex systems are needed.

I found many shortcomings in the scholarship related to my research. First, it is interesting that the clear majority of scholarship devoted to urban agriculture, including that which is most comprehensive and related not only to theory but to practice, is devoted to urban agriculture in developing countries. Elements of this scholarship could be applied to urban environments in the United States and other developed regions, but the scientific validity of extrapolating research and findings from such a different context to our own culture would be very suspect. Thus, the dearth of research devoted to urban environments across cultures and socioeconomic status presented a shortcoming in my own findings.

Second, as mentioned above, many of the technological innovations associated with urban agriculture exist only in the theoretical frame. As theoretical constructs, they cannot be used to make recommendations outside of the recommendation that they actually be built.

Third, the research related to my topic is broad, informed by many disciplines and perspectives, and of greatly differing levels of scholarship. Attempting to narrow it down to specific recommendations was very challenging, and at the end resulted more in analysis and recommendations for more research across disciplines than in a clear recommendation for actual future practice.

Finally, and perhaps most importantly, I went into this topic intending to research both the benefits and risks associated with urban agriculture, and while I found many examples of research devoted to documenting potential benefits, there was a clear dearth of research devoted to risk. In fact, I found very little current research documenting known risks associated with urban agriculture, especially outside of the context of

developing countries. I do not believe this is owing to a lack of risks. Rather I believe that this is an understudied component of urban agriculture, and one that is absolutely essential to better understand in order to ensure that urban agriculture represents a positive, and not negative development for urban residents. Those researching, designing, and implementing urban agriculture efforts should work to ensure that efforts are both theory and data driven, and well documented with specific recommendations for future application.

Assessment of Possible Applications and Extensions

Urban agriculture, I believe, will emerge as one of the most significant trends in urban development and evolution of all time. Whether the future of urban agriculture lies in a return to Carolyn Steel's "sitopias" (the reliance on the use of peri-urban farms to feed cities) or in Despommier's 60-floor vertical gardens; the direction of urban agriculture may be in question but its eventual and ever-increasing use to help meet the food needs of urban residents is not. However, in order to proceed in a manner that will avoid the replication of unhealthy and inequitable farming practices associated with industrialized agriculture, a dynamic, cross-discipline approach to scholarship is needed.

Urban planners have largely left urban agriculture out of planning efforts related to urban development, and the result has been catastrophic. Food deserts in inner cities correlate strongly to rates of heart disease, diabetes, and obesity in urban communities of color, while in the developing world, lack of sanctioned space for urban agriculture has left individuals, their families, and entire communities at risk for the consumption of environmental poisons, waste-associated pathogens, and zoonotically transmitted disease. Urban planners need to integrate urban agriculture into comprehensive city and even

regional planning efforts; urban agriculture is both an inevitability and a necessity for the future of urban environments, and sanctioned recognition will largely shape the eventual reality of urban agriculture in the city environment.

Urban planners will also need to recognize that urban agriculture is emerging as both a new discipline and a new practice. A level of cross-disciplinary collaboration uncommon to the field will be required for urban agricultural efforts to emerge from their current theoretical applications into real-world practice. Public health, engineering, material sciences, hydrology and soil science, sociology and environmental psychology are some of the academic and research disciplines that will necessarily inform the development of sound, ecologically-friendly, and community empowering urban agricultural development. Mubvami and Mushamba (2006) have analyzed Chapin and Kaiser's five classic models of urban planning and have found that urban agriculture may play foundational roles in ecological, new urbanist, collaborative, just city and new life models of urban planning.

Urban agriculture has the potential to radically transform the built, social, economic, and nutritional environments associated with urban life. However, the gulf between potential and current applications is wide. A wise starting point would be to concentrate a large share of research onto urban agricultural efforts that are currently in place. Work with poor communities engaging in urban agricultural efforts to begin offering evidence-based assessments related to the presences of pollutants in urban soils and water sources; collaborate with those in public health to make wise recommendations related to safe consumption of urban-grown foods, and begin from a framework that recognizes that individual rights to food, self-determination, and autonomy are at least (if

not more) as important as the ecological benefits that may also be associated with urban agriculture.

Urban Agriculture: The Importance of Interdisciplinary Research Across Typologies and the Social-Ecological Spectrum

Urban food systems start at the level of the individual, and expand across the social-ecological model to the relationship (block, family, and peer), community (neighborhood and city) and societal (regional, national) levels. Increasing assessment and research of urban agricultural risks and benefits across both levels of the social ecology and by typology (formal vs. informal) can thus also inform not just production of agricultural foodstuffs in urban environments, but also the dynamics of the larger food systems in which urban agriculture occurs. Such research could diverge from a starting point focusing on urban agriculture to larger questions related to urban food systems. Important future research will address food processing, food distribution across the levels of the social-ecological model, food equity across the socio-economic spectrum of a given community (or even region), community perceptions of food (its relative value within a cultural context), the role of recycling and reuse in urban food systems, and perhaps most importantly, how food waste can be reduced in urban food systems.

The social ecological model provides a framework for understanding the complex effects and interrelatedness of elements within a given activity occurring in a social environment. Such an analysis can thus delineate systems and relationships occurring in greater urban food systems, and the role urban agriculture might play within such systems. This model can offer a proverbial “big picture” assessment of urban agriculture, and how practices (and research) must transcend an emphasis on any one level in order to

avoid underestimating the risks, rewards and other effects related to urban agriculture in the context of the other levels. For example, research focusing solely on urban agriculture as an individual output / practice cannot in itself articulate the complexities of that practice within a given community. What are the norms that encourage, discourage or even prohibit such individual actions? Typically, the social ecological model is ascribed to four socio-cultural contexts within a given ecology, the individual, family / relationship, community, and society.

At the individual level, research on urban agriculture risks and rewards would largely focus on individual / personal indicators related to food and diet. These individual level indicators could be viewed as largely "internal" to the individual(s) in question, such as the attitudes, beliefs and behaviors she or he has related to urban agricultural practices. These in turn are refracted through the contextual lens of age, education and socio-economic status.

At the family / relationship level, urban agricultural research should include assessing the unique role of relationships within urban agricultural practices, how friends, partners, and family members influence behavior and contribute to the range of urban agricultural typologies. For example, how are peer-perceptions of gender related to inclination or disinclination towards urban agricultural practice? How do practices in the family factor in to the rate of adoption of new urban agricultural practices in later generations?

At the community level, urban agricultural research could analyze the settings (typically the "social contexts" in which individuals and relationships interact -- schools, workplaces, places of worship and neighborhoods) in which urban agricultural practices

are taking place, and what the characteristics of these settings are. Such research could strongly inform both practice and policy recommendations. For example, what are the social demographics of neighborhoods with strong urban agricultural ties? Are the residents affluent, and growing food for recreation, or because there is a lack of grocers, and thus a lack of access to fresh fruits and vegetables? What is the role of schools in educating young people about food systems and how urban agriculture plays an important role in such systems?

The social level focuses on those complex societal factors that encourage or discourage urban agricultural practice, including the social and cultural norms of the greater culture of which the urban environments are part. These large-scale societal factors include such indicators as government policies directly or indirectly related to urban agriculture such as health promotion, food safety, and economics. For example, research related to urban agriculture and societal factors might quantitatively analyze the economic policies that encourage or discourage large-scale formal urban agriculture practices at a state, regional or even national level.

The social-ecological model, while containing four distinct nodes, also provides a model for assessing the diffusion of urban agricultural innovations *across* levels, in order to better understand the "ripple" effects and synergistic impacts of both related and unrelated urban agricultural practices. For example, how do individual contributions to urban agriculture in a given city contribute (or not) to city or even state-level economies? Is there a formal relationship between social representations of urban agriculture, such as the Obama White House organic vegetable garden, and the adoption of local urban

agriculture practices? Analysis of urban agriculture innovations and diffusions across the levels of the social ecological model can provide insight and answers to such questions.

As the risks and benefits of urban agricultural systems are quantified across agricultural typologies, new research frameworks and methodologies that can better describe the complexities of urban agricultural systems should be utilized. Holistic research perspectives such as those found in systems dynamics analysis can offer a new approach to studies that demonstrate how relationships between constituent parts might give rise to the collective outputs of urban agricultural system, and how the system interacts and forms relationships within both its cultural and physical environments. Within urban agricultural research, systems dynamics concepts such as multiscale hierarchical relationships, emergent patterning, information flows and constraints, system-environment interaction and typologies of self-organization could serve as valuable research tools for both qualitative and quantitative research on urban agricultural systems.

Interdisciplinary research touching on many different disciplines related to the potential risks and rewards of urban agriculture is particularly well suited to interpreting the impacts of urban agriculture policy and practice alike. By merging traditional cost-benefit analysis with the growing understanding of the complex, dynamic state of the modern urban environment, it is possible to understand urban agriculture from multiple perspectives: the economic and environmental impacts, and the social and structural support and constraints alike. Such a comprehensive analytical framework thus allows research to transcend the traditional economical analysis to include and quantify the nonmonetary benefits of both formal and informal urban agricultural production.

The use of economic analysis methods has expanded to include not only measures of both formal and informal economic values, but environmental indicators as well (Pearce and Turner, 1994); such analysis within urban agriculture remains understudied (Nugent, 2008). For many researchers and policy makers alike, the ability to demonstrate quantifiable benefits of urban agriculture in traditional economic and environmental models remains out of reach. The International Development Research Center (IRDC) calls for the utilization of proxy indicators and indirect impacts as a way to measure complex economic, environmental and social benefits and risks related to urban agriculture. A drop in diabetes rates in a neighborhood facing social, economic and health disparities could be used as a quantifiable measure (in health-care related savings) to demonstrate the economic value of front-yard gardening. Similarly, a drop in the rates of neighborhood crime could be used as an indicator to document the social impacts of urban agriculture (by demonstrating the increased total-hours of individual resident time spent outside, where observance of neighborhood goings on can take place) (Ibid., 2008).

The use of such indirect impacts and proxy indicators cannot document the direct causal relationships between risk and reward associated with most standard analysis, yet they are an important first step to begin quantifying a system with profoundly complex inputs, networks, relationships and impacts. As research methodologies in agriculture and economics advances, interdisciplinary analysis drawing on everything from architecture to plant genetics will provide for an even-more nuanced understanding of direct and indirect impacts and indicators related to the benefits and potential costs of urban agriculture.

The “gold standard” of policy development has long been the use of a traditional cost-benefit analysis. Whether demonstrating positive changes in the economy, or increases in social welfare, benefits are simply those impacts that increase quality, quantity or societal well-being. Costs are simply the converse, the actions, interventions and impacts that lower quality, quantity, or social well-being, or those actions for which the amount of input is greater than the commensurate output.

Applying interdisciplinary research perspectives to a traditional cost-benefit analysis can provide a much more detailed picture to the urban agriculture researcher, policymaker, and practitioner alike. As with any cost-benefit analysis, the intention remains to demonstrate positive outputs (benefits). While maintaining the cost-benefit analysis focus upon quantifiable impacts, interdisciplinary research on urban agricultural systems could allow a more comprehensive understanding of benefit: how do the nature of benefits differ across typologies of urban agriculture from the most informal (a front-patio herb garden) to the most advanced / formal (the development of large-scale aquaculture in Detroit)? How do these benefits manifest themselves differently throughout a shared population? How do urban agricultural innovations diffuse themselves through a community, city, and region and beyond?

Whereas the traditional cost-benefit analysis may have focused with near-exclusivity on outputs (are increased yields always beneficial, even if the food is wasted?), how does the environmental degradation associated with this increase factor into the total analysis? Interdisciplinary analysis of costs and benefits associated with urban agriculture can also better respond to the complex differences between rural and urban agricultural systems. While urban agriculture, at its most basic, could be viewed as

simply “farming in the city,” the reality is that the practice has little to do with the transplantation of rural agricultural practices wholesale into the city. When confronted with dramatically divergent economies of scale, and the potential impacts and costs associated with those differences, it is necessary to develop a typology to better quantify differences between the two agricultural models in order to accurately assess the costs and benefits associated with urban agriculture specifically.

The traditional agrarian / urban relationship is largely based upon converse inputs and impacts between urban and rural environments. Cities need the resources and labor imported from outside in order to provide for their populations, whereas rural environments needed the tools and technologies developed in cities to meet their own needs. In short, neither urban nor rural environments were perceived to have the tools, resources and commodities available to attend to their own needs.

A more evidence-based movement to quantifying risks and rewards of urban agriculture, however, has allowed a more comprehensive understanding of what “self-sufficiency” means and how it can be attained. Shanghai, the United Nation’s “self-sufficient” city may now be the exception, but interdisciplinary research in such food systems may provide ideas for ways to transform urban food systems into new models worldwide. Such new models may never do away with the need for rural imports, but they may have truly transformative potential for urban sustainability in an era of decreasing oil production (for example).

By integrating principles from outside of the “traditional” fields of botany and agroecology, urban agriculture research can integrate concepts such as the impact of open and closed feedback / loops, which could help researchers identify ways in which urban

agriculture could significantly reduce both the need for rural imports and urban exports. By integrating urban agricultural practices into the daily life of urban residents, the economies of scale so different from rural communities offer potential "ripple effects" in urban environments capable of producing positive outputs not directly commensurate with inputs. If all urban residents grew some kind of food, for example, it may not only lessen the need for rural imports of produce, it may dramatically lower the need for urban export of waste, thereby freeing up urban resource to meet other demands.

Additionally, a holistic, interdisciplinary approach to urban agriculture can provide researchers, urban planners, policy makers and others the methodologies necessary to understanding one key recommendation related to urban agriculture: the need to develop and integrate urban agricultural systems that can meet the unique local needs and resources of individual neighborhoods, communities, cities and regions. In short, these perspectives can provide a framework for developing systems that are resilient and adaptable, diverse and dependent upon the complex inputs associated with *any* urban environment.

Where a traditional cost-benefit analysis of food insecurity in Kampala, Uganda may have focused overwhelmingly on inputs (if we can feed the city, we have accomplished our mission), a more interdisciplinary perspective would, while focusing on inputs, also look at both indirect and direct causal relationships associated with these inputs (or lack thereof). Is the unavailability of food related to interruptions in the supply chain (drought, shipping strike, global trade sanctions), or something else (poverty of urban slum residents)? How can this understanding of causation help shape the response? In all the above scenarios, urban agriculture emerges as a benefit, insomuch as it

produces the same inputs as those impacted by supply-chain and economic disruptions. However, urban agriculture also (in this scenario) positively impacts other complex networks and feedbacks within the urban system. Left-over produce can be sold, leading to economic benefits for the urban farmer and greater food security for the entire urban community.

Interdisciplinary research and analysis can provide a more coherent analysis of the complexities of a given urban environment. Is a lack of locally produced horticultural commodities a result of a scarcity of urban open space, a lack of education on urban agricultural production, a shortage of water, or a combination of all the above? Interdisciplinary analysis not only provides a more comprehensive picture of the challenges and disparities extant in an urban environment, but also presents new and innovative ways of looking at potential solutions: rather than providing more food-stamps to families living in poverty, what divergent outputs and outcomes could result from a comprehensive training program in growing food for both household consumption and sale at a local farmers market? The first proposes a standard zero-sum outcome, whereby provision to one results in a reduction to another, whereas the second is a transformative model whereby provision to one results in the potential provision, not reduction, to another as well.

From an outputs perspective, interdisciplinary analysis of urban agriculture also illustrates the potential for both direct and indirect tangible incentives related to urban agricultural development. Salt Lake City, for example, does not promote community gardens as a way to fight crime and raise property values, but an analysis outside of the typical agricultural methods may reveal that city support of community gardens

demonstrate significant indirect values associated with urban agriculture from perspectives far outside the traditional input-centric model. Such an analysis may reveal increased community feelings of well-being, increased property values associated with preservation of open space, etc.

In the traditional input-output economic models on which much of urban planning was based, urban food systems were understood to be composed of separate, yet interacting, parts. Agricultural production, associated as it was with peri-urban and agrarian production, was viewed as distinct from the food systems into which the production outputs were integrated. What we eat, in short, takes place outside the system(s) that produced what we eat.

An interdisciplinary analysis of urban agriculture illustrates a completely different model. Regardless of what was produced and / or consumed where, both interact, by nature of the consumer, in a greater food system with its own outputs and impacts. By looking at these outputs and impacts from one complex perspective (rather than two simple perspectives of correlative inputs and outputs), it may be possible to develop entirely new urban food systems simply by changing the nature of the input. Simply put, urban agriculture may not only transform the "supply side" of urban food systems, it may radically alter the outputs of that same system, in effect creating a completely new food system altogether.

As documented in the literature review portion of this paper, traditionally the potential risks and rewards of urban agriculture have been broken down according to urban agriculture's relative economic, environmental, and social sustainability. By developing a more comprehensive, interdisciplinary research framework on urban

agriculture, more resilient, adaptable and responsive models of urban agriculture may emerge. The development of new indicators, impacts and outcomes could be used to help individual cities meet their own diverse and unique needs related to urban agriculture and the greater urban food systems of which they play a part. Salt Lake County, for example, has expressed interest in developing community gardens on county-owned lands that would otherwise lay fallow until formal development occurs. By analyzing neighborhood demographics (including those related to food security, but also those related to health and economic status) alongside county open-space maps, the county may develop a typology for assessing priorities in the funding and development of these new community gardens, rather than simply placing them in randomly selected sites based on the relative presence (or lack thereof) of other community gardens (for example).

Vast differences remain across settings and typologies, yet it is telling that urban agriculture requires the same inputs, and produces the same outputs, as rural agriculture: water, soil, sunlight, animal feed, etc. However, the dynamics of the two systems vary greatly in terms of the relative weight of these inputs and outputs. For example, rural agriculture is typically irrigated with "fresh" water, whereas urban agriculture may be irrigated with reused gray water. Rural agriculture may rely upon the use of animal fertilizers (manure) where urban agriculture may utilize household produced wastes such as compost. Once produced, urban agricultural commodities may require less packaging, less fuel for transport, and different marketing schemes (a farmer's market vs. a traditional grocer, for example) than traditional agricultural outputs. The economic dynamics of urban agriculture too bear little resemblance to rural agricultural production.

Food may be consumed directly by those who grow it, or shared or given away, never entering the formal economic system.

The development of new interdisciplinary research methodologies may also provide especially useful insights in assessing benefits (and risks) associated with both urban and rural agricultural production. In the city and country alike, an accurate assessment of potential site-specific threats and benefits can facilitate the development of "best practice" based urban agricultural production. Site toxicity, urban pollution, and groundwater contamination are just a few of the important considerations that should be taken into account in urban agricultural development; practical and policy recommendations from an interdisciplinary perspective can help to balance such concerns against a wide array of potential benefits, and may also be employed to develop creative solutions to unforeseen threats. For example, interdisciplinary analysis may help planners understand where within a community urban agriculture stands to offer the most residents the most benefit, even if the site is contaminated, interdisciplinary work may include scientific methods to ensure that urban agriculture conducted in such sites may not only be conducted safely, but may even remediate the damage done to the environment and community, thus using plant and soil science as a tool to not only meet a community's nutrition needs, but to undo legacies of environmental racism as well.

Regardless of desired outcome, for urban agricultural impacts, indicators, risks and rewards to be accurately assessed, researchers should begin by assessing the potential system from a truly interdisciplinary research (not purely "input / output") based perspective. From such an analysis, researchers, community members and policymakers alike can better determine how to create urban agricultural systems that are not just

environmentally and socially sustainable, but also simply the best possible response to the complexities inherent in a twenty first century urban food system.

Additional Recommendations

An additional recommendation relates to the need to distinguish, when making policy decisions related to urban agriculture, between the potential for urban agriculture as potentially large-scale market-driven actions that are both resource and capital intensive, and urban agriculture that is subsistence based (i.e., formal and informal urban agriculture). Just as both forms of urban agriculture relate strongly to food security in urban settings, both have very different potential outcomes and emphasis for urban residents. The development of large-scale urban agricultural centers will not necessarily address social injustice, poverty, or environmental sustainability, yet it is possible that informal urban agricultural activities simply may not provide the radical food production shifts required in rapidly urbanizing settings. As urban centers begin the process of integrating urban agriculture into local land use development policies, it will be important to recognize the different outcomes different policies might engender. Without prioritizing at the outset either for-profit or nonprofit urban agricultural production, urban planners should work to include arable land in land use surveys, in order to better inform the development of urban agriculture within both sectors. Such steps will better ensure that the future of urban agriculture is treated as an integral and important aspect of all urban land use processes, and subject to the same concern, consideration and methodology.

My final recommendation for possible application and extension directly relates to my above conclusion. If empowerment-based methods of urban agricultural production

have the potential to radically transform the built environment in positive ways, then the active involvement and true participation of urban residents in *other* urban planning activities should also be encouraged. In other words, if participatory practices are an essential component of healthy, sustainable and transformative urban agricultural practices, it stands to reason that community participation would benefit both participant and project in other urban planning efforts. These might include green space development, park design, street use; the full range of physical spheres where the social, private, and public worlds collide. Michael Pollen calls these spaces "the subtle yet unmistakable frontier." These urban spaces serve to do the exact opposite of the psychosocial ills and socioeconomic determinism associated with authoritarian, "top down" planning practice (Pollan, 1989).

SECTION 4

SUMMARY AND CONCLUSIONS

Urban agriculture, especially informal urban agriculture, may just be the most concrete evidence available that individuals and communities, including those facing severe socioeconomic disparities, are planning their environments every single day without the aid of formal urban planners. There are lessons to be learned here, lessons that can be applied to a wide variety of settings and planning efforts, if we are only willing to consider them.

In her excellent lecture "How Food Shapes Our Cities," Carolyn Steel traced the historical development of both urbanism and agriculture to one common root. The earliest cities literally began as farms. Urbanism could not have developed without agriculture, and for the overwhelming majority of human history, agriculture was an ingrained, essential part of everyday life. For some, it still is; for others, such as myself, it is easy to forget that the model of agricultural production we know so well-- the tomatoes shipped year-round from Chile, the cheap proteins raised in feedlots that stock thousands of animals-- is a rather historically inaccurate one.

Urban agriculture, as defined early in my paper, is simply the production of food in an urban context. Or is it? Is it food production, or is it large-scale social and environmental transformation? It is, I believe, both. I believe that urban agriculture is a transformative tool for urban planning, and an activity that can radically impact individual lives, the shape of our communities, and the ability of urban environments not only to sustain themselves, but owing to economies of scale and the overwhelming trends towards urbanization taking place globally, sustain our world.

In a field in which we learn a great deal about both the problems and potential solutions of a world in environmental crisis, it can be tempting to throw ones hands up in the air, to forget that something can be done. Many individuals and community members are unsure as to how to begin actively involving themselves in moving urban environments to social and environmental sustainability. Urban agriculture represents this action in concrete form. Urban agriculture reminds us that sometimes our biggest problems do not require the biggest, most complex solutions, but rather a return to something simpler, to less complex systems, but also to a more complex understanding of those systems. It reminds us that sometimes we simply have to step back in order to jump further.

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